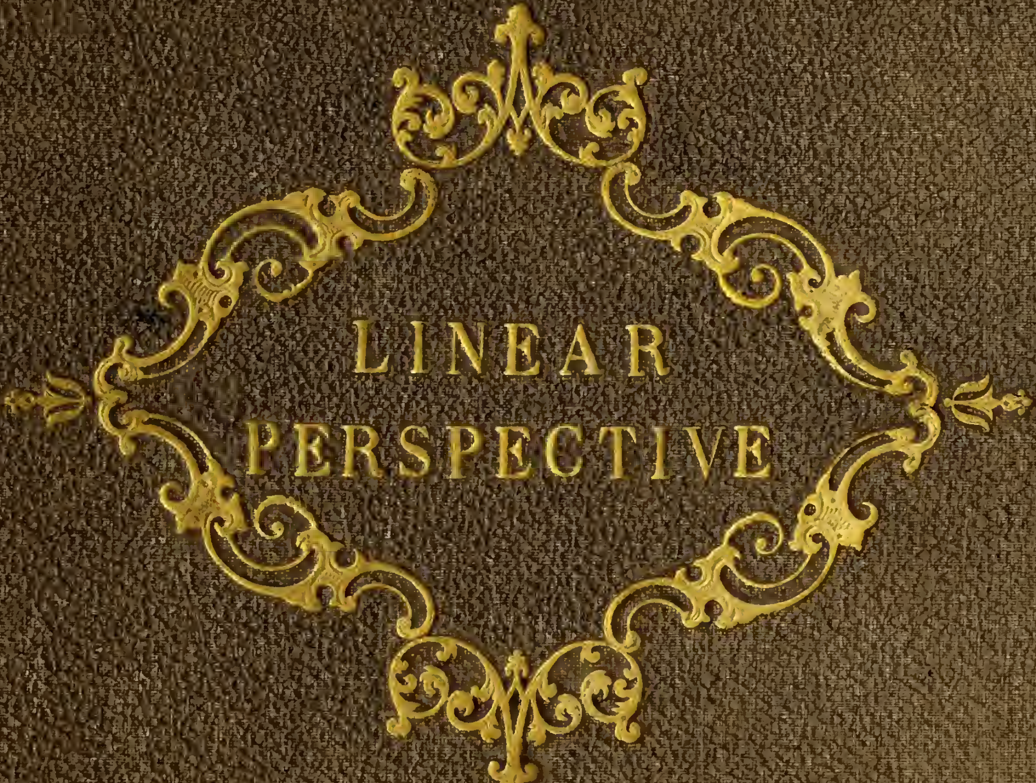

LINEAR PERSPECTIVE

Ulrich Middeldorf

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LINEAR PERSPECTIVE.

COMPLETE IN FOUR PARTS, 2s. EACH.

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LINEAR PERSPECTIVE.

THERE are two kinds of perspective — Linear Perspective, which refers to the forms or outlines of objects; and Aerial Perspective, which treats only of their colours. The latter not being subject to any positive rules, the following remarks will refer only to the Perspective of Lines.

Objects copied by the draughtsman are not and cannot be under their actual forms; their apparent forms only can be represented, and for this purpose we have recourse to positive rules.

This Work being only a very concise abridgment for the use of young students, is intended chiefly to induce them to study this science, and to enable them to avoid gross errors either in drawing from nature or copies.

OF THE HORIZONTAL LINE.

The line which separates the earth from the sky is called the Horizontal Line. It is easy to determine it in a flat country, or where water is perceptible at the extreme edge of the landscape; but if in the subject to be represented this line should not be visible, it nevertheless exists, although concealed by intervening objects: its height may be ascertained by the following simple means.

This line is always placed on a level with the eye of the spectator, and rises and falls according to his position. Ascertain its place by holding before your eye a thread, or the edge of a flat ruler across the view you wish to copy, and you will have the horizontal line, which would be perceptible if the intervening objects were transparent. So great is the importance of this line that it must be the first consideration either in sketching from nature or in composition. We have shown how to obtain it in the former instance, but in composition taste is our only guide. Here the feeling of the artist is absolute, and he may vary at will the effect of his picture by changing the place of his horizontal line.

EXAMPLE I.

The horizontal line is always placed on a level with the eye of the spectator. Thus, for the figure No. 1, who is seated, the horizon is lower than for No. 2, standing; but it is highest for No. 3, on elevated ground.

OF THE PRINCIPAL VANISHING POINT.

The principal vanishing point, called also the point of sight, is placed on the line of the horizon opposite the eye of the spectator. In nature it is always found in the centre of the view embraced by the eye, and, strictly speaking, it should also be found in the centre of the picture, but experience has given rise to certain rules permitting the variation of its place according to circumstances.

OF THE POINT OF DISTANCE.

To elucidate the use of this point, suppose the spectator looking at a view through a window and drawing thereon the various objects within sight. Thus traced every thing will be in good perspective: the situation of the eye looking at them will represent the point of sight, and the space from the eye to the window will represent the point of distance. Upon this principle, measure this space, transfer it to the side of the drawing to the right and left of the point of sight on the horizontal line, and you will determine the point of distance.

In drawing from nature take the distance from the feet to the base of the picture, or to the objects on the first plane of the view you wish to sketch; carry it out of the picture, measuring from the point of sight, and you will have the same result.

OF THE EFFECTS OF PERSPECTIVE.

In looking along a gallery the ceiling appears lower as it recedes, the floor seems to rise correspondingly, and the walls to approach each other. In a straight street the houses appear almost to touch at the further end. The same effect is observed in a long avenue of trees, and in fact in all pictures embraced by our eye in nature. All the parallel and vanishing lines tend towards one point, where, if carried out indefinitely, they would meet.

EXAMPLE II.

The ground being supposed perfectly flat, and all the figures of an equal height, they would be in good perspective if their heads touched the horizontal line, which would not be the case were the spectator to choose an elevated spot from which to take his view. The vanishing lines of all the objects which are seen in front tend to unite at the point of sight, which will always be indicated by the letters P P in the following Examples.

EXAMPLE III.

The spectator is seated on level ground, half his height is lost, whereas the other figures in the picture, being upright, half their height should rise above the horizon which passes across the middle of them. The house is three times the height of the man, therefore it will be necessary to measure the figure touching the house, and who is the same distance from the base of the picture as the house, and mark three times this measurement upon a vertical line which will determine the height. Supposing the tree to be six times as large as a man, we must measure a figure on the same plane with the tree, and proceed as before with the house. If the door is to be half as large again as a man, measure accordingly.

In Examples 1 and 3 we have placed the spectator in the picture merely that the pupil may more clearly understand our meaning; but, as we have said that the spectator or artist should be distant from the picture three times its breadth, it follows he is placed on this side of the design. Hoping now that this is clearly understood, and not to give a false idea of perspective, we shall no longer draw the spectator in the picture, but suppose him in his right position.

EXAMPLE IV.

The spectator is on an elevation twice his own height. To obtain the relative proportions of figures we must dispose them in such a way that we may have twice their respective heights between their heads and the horizontal line. For the measurement of the house and tree, the size of the man already given will be a sufficient indication.

Apply the same rule to all the other objects, which need not be enumerated. By attention to the foregoing rules the importance of the horizontal line will be apparent.

In Example 2 the point of sight serves as a vanishing point for the lines which are at right angles with the horizon. In this Example the depth of the objects is determined at will, as also the place of the door. The latter is really in the *centre* of the wall in which it is placed, though not in the perspective centre. To determine this place correctly, as well as the termination of the wall, we must adopt the following means.

EXAMPLE V.

By the use of the point of distance we arrive at the perspective depths of objects; thus, to get the depth of the wall which represents the same as that in Example 2, we must arrange what measurement we wish to give it, and mark it upon the prolonged dotted line 1, 2. From this point carry a vanishing line to the point of distance (which in this case is only one and a half times the width of the picture from its edge) to its intersection with the vanishing line 1, and we shall have the point 3, and the vanishing line 1, 3, will be equal to the horizontal 1, 2. The same applies to the door. We are obliged to carry this example to the edge of the page to enable us to obtain the point of distance. Another method will be given in the following Example, which consists in diminishing and bringing it as close as possible, by this means obtaining the same result.

EXAMPLE VI.

TO DRAW SQUARES IN PERSPECTIVE.

Determine the depth of each square by the intersection of a line running to the point of distance, and that vanishing towards the point of sight. Thus, the depth of square No. 1, is found by the vanishing line which goes to the point of distance, and which is in this case the same width as the picture. But were the drawing at the edge of the paper, or its size such as to preclude the possibility of adding a lengthened horizontal line, we must then take half the measurement of the object and bring the point of distance *closer* by one-half, which will by this means be found on the edge of the picture; and lines drawn half the size of the object will give the same points as those drawn the whole size and going to the true distance. The diagonals of a square seen at right angles always run to the points of distance.

TO DRAW A CIRCLE IN PERSPECTIVE.

For facilitating this operation we have recourse to a geometrical plan, which has the advantage over a perspective plan, of representing the real forms of objects, and preserving the exact forms of all their parts.

EXAMPLES VII, VIII.

Let a circle be drawn in the square 1, 2, 3, 4. To describe it in perspective of the same size, take the measurement of the side 3, 4, mark it on the base of the picture, and proceed as before. When the square is thus described, and the diagonals run to the points of distance established, in fixing also the points 5, 6, as in the geometrical square, and drawing from these points two lines to the point P P, they will cut, as in the geometrical figure, the diagonals at the points A, C, G, E, which will be easily recognised as the points corresponding to the like geometrical points. The same for the two diameters D H, F B; then form the ellipse representing the circle in perspective. This method of describing a circle in a square is the most simple in order to obtain the perspective representation of this figure, and once thoroughly understood may be easily applied to all arched objects, placed above or below the horizon, as well as those placed vertically to the right or left of the point of sight.

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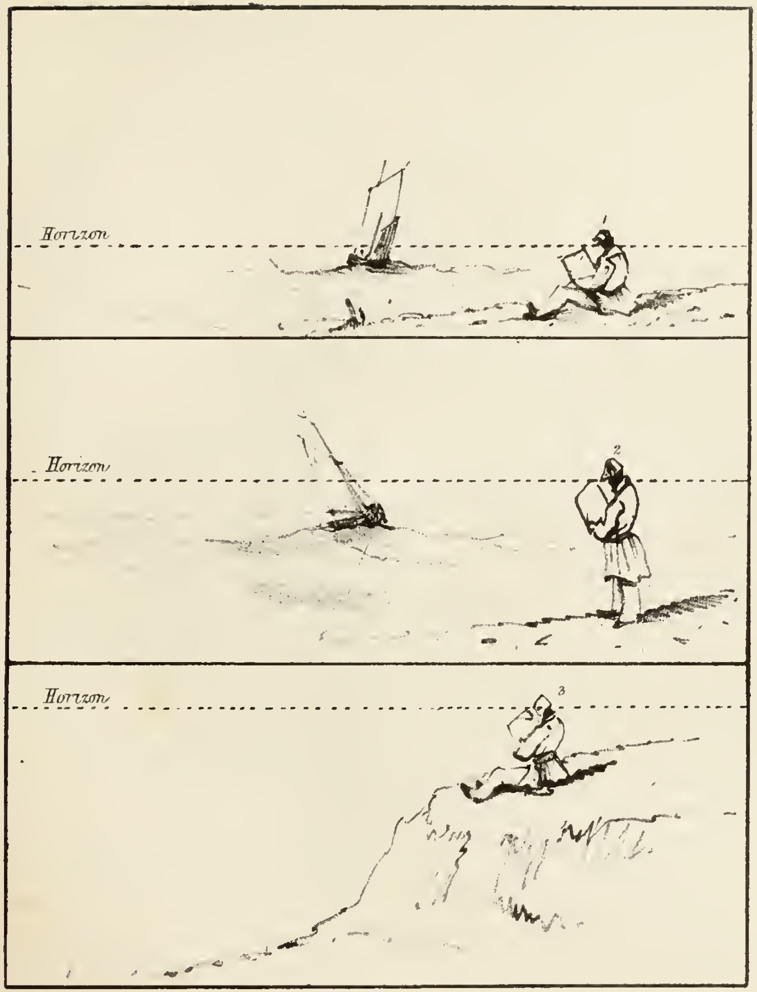

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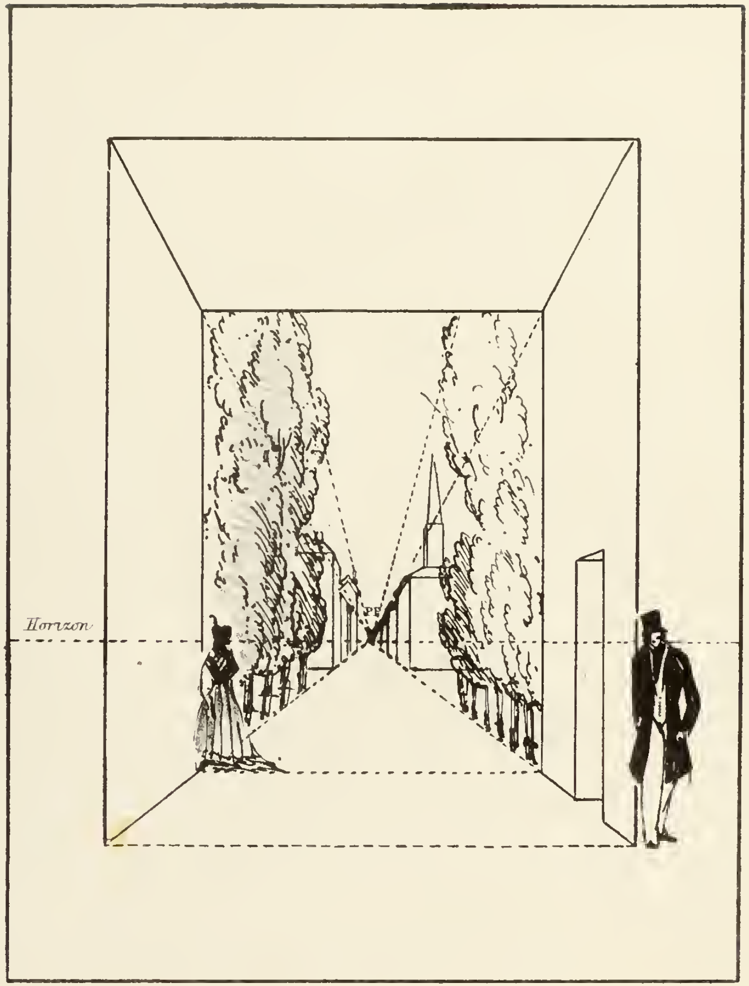

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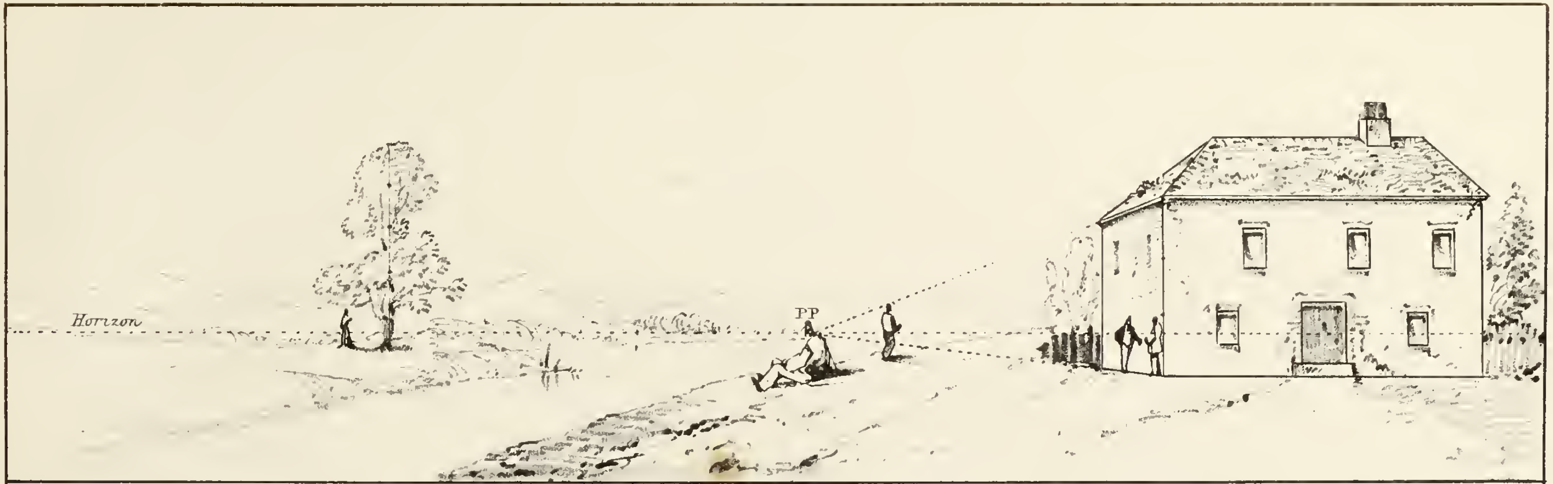

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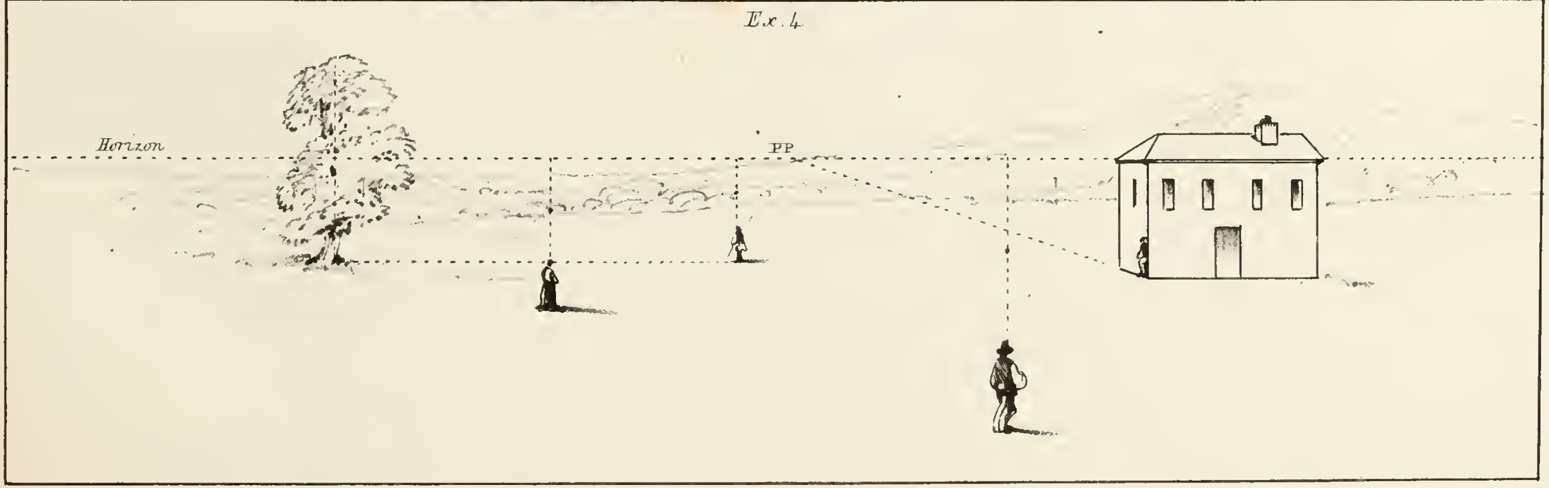

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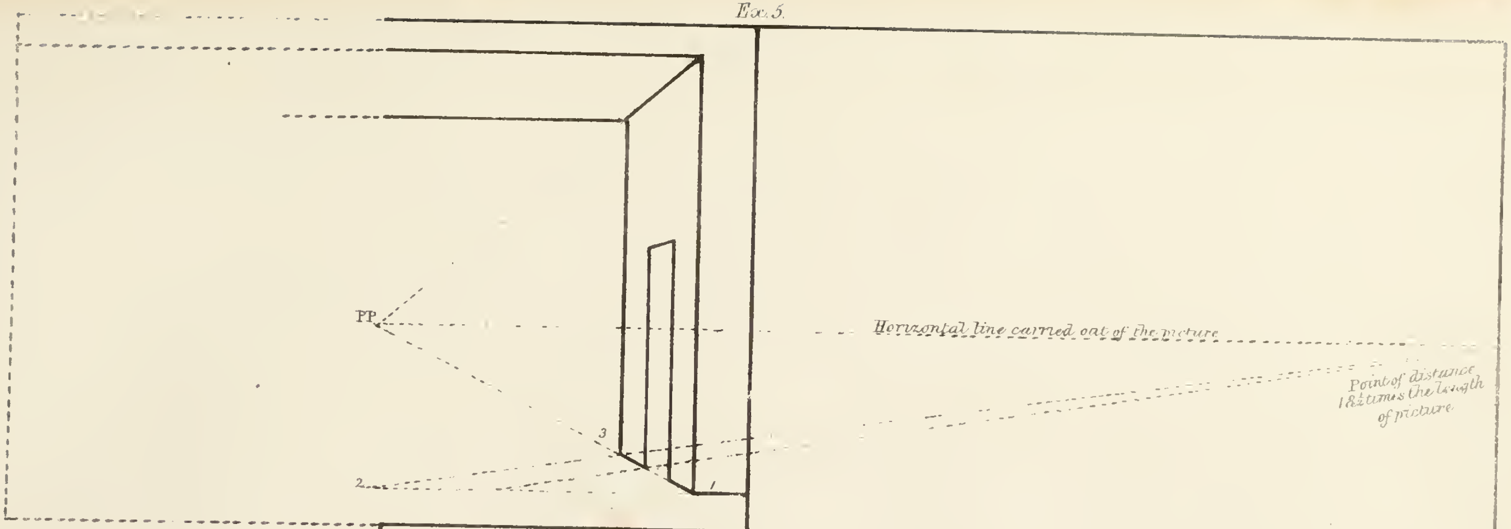
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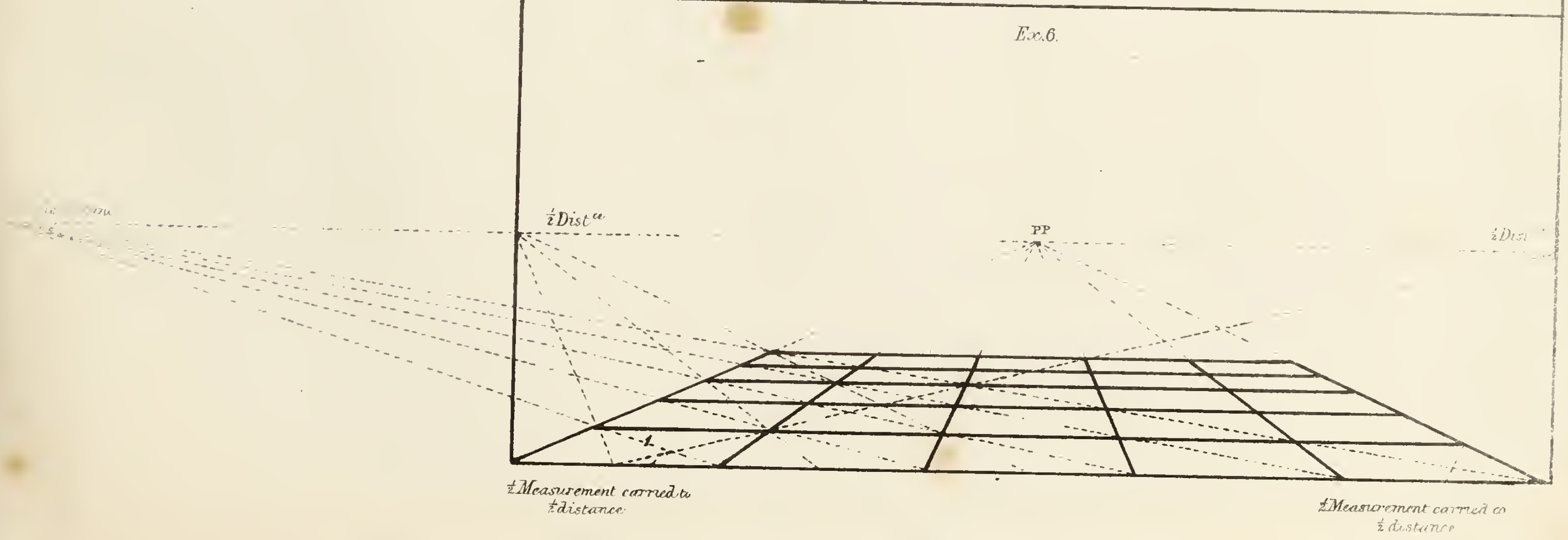
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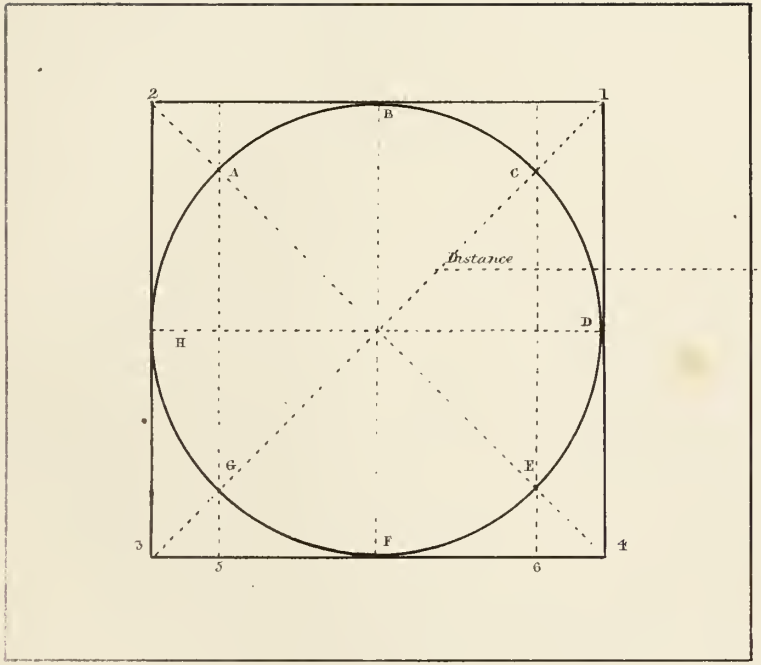

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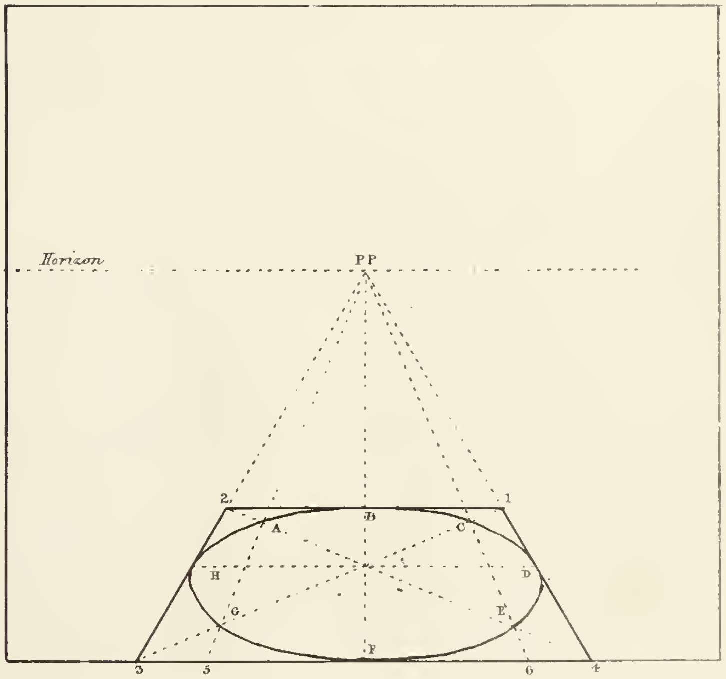


EXAMPLE IX.

TO CONSTRUCT A ROUND TOWER.

Adopt the same means and carry out above the horizon the same working as that in the preceding Example 8. We shall see that the circles drawn upon this tower, either for forming the rows of stones, or for any other purpose, become less curved as they approach the horizontal line, and should one occur at its exact height it would be represented by a straight line. The points 1, 2, serving to determine those of the curve on the diagonal lines, are those represented in Example 7 by the points 5, 6.

EXAMPLE X.

TO FORM ARCHES IN A FRONT VIEW.

The first half circle being traced with the compasses, from points 1,. 2, draw lines to the point of sight, and take at will upon the vanishing line 2, the point 3, which will be the perspective distance of the arches; from this distance draw a horizontal line, which will be the diameter of the second half circle; from point 4 to the point of sight draw a line and it will give you the centre of all the other half circles. From the point 5 describe with the compasses the second half circle. To obtain the third; from point 2 through the point 5 draw a line which will meet the vanishing line 1 P P; to the point of junction carry a horizontal line, which at its intersection with the vanishing line 2 P P will give 6. 6, 3 is equal to 3, 2. Proceed the same for the fourth and fifth, and any number of arches required.

EXAMPLE XI.

OF VANISHING SCALES.

They are used to give respective proportions of objects placed on different planes of a picture; thus the person 1, placed in front of the picture, should, by means of a vanishing scale, give the proportions of all the others. Such a scale may be thus established. From the feet of figure 1, draw a horizontal line towards the vertical forming the extremity of the picture to the point 2; from this point transfer the size of the person to 3. From point 3 draw a line, joining the horizon at the point F upon the edge of the picture.

All the lines comprised in this scale will be of the same dimension; thus, to obtain the height of 4, 5, measure the width corresponding to the plane of this figure.

Upon raised planes it is also necessary to measure the size by the vanishing scale; because, to give the correct perspective, the eye must see at once the whole of the picture without turning the head. Elevated objects are of the same height as those which are below and in the same plane. The figures will serve as in Examples 3 and 4 to measure all other objects composing the picture.

EXAMPLE XII.

OF INCLINED PLANES.

To raise a slanting roof, draw a perspective square by the plan already taught, and from point 1, the centre of the perspective square, raise a vertical line and determine there the height of the roof, say at point 2, and join this point to the four angles of the square.

The inclination of the roof upon which the pavilion is built being given by the line 4, 5, prolong it to the juncture of a vertical line raised from the point of sight, giving the point F, and carry there the lines A, 3, and 6, 7. The line 5, 8, forming the frontage, ought to incline to a point placed upon a vertical lowered from the point of sight, and at the same distance downwards as the point F is above. The inclination of the roof 9, 10, being less sudden than that of the other roof, its vanishing line on the vertical elevated from the point of sight, should be placed lower.

ON OBLIQUE PERSPECTIVE.

All the vanishing lines of the foregoing Examples have inclined to the point of sight, because they form a right angle with the horizontal lines. This perspective is called Right Angle Perspective, and is employed generally by the old masters. But as it sometimes happens that objects are viewed so that their outlines are not perpendicular to their ground lines, these lines tend towards points called accidental points, and the perspective of these objects is named Oblique Perspective.

EXAMPLE XIII.

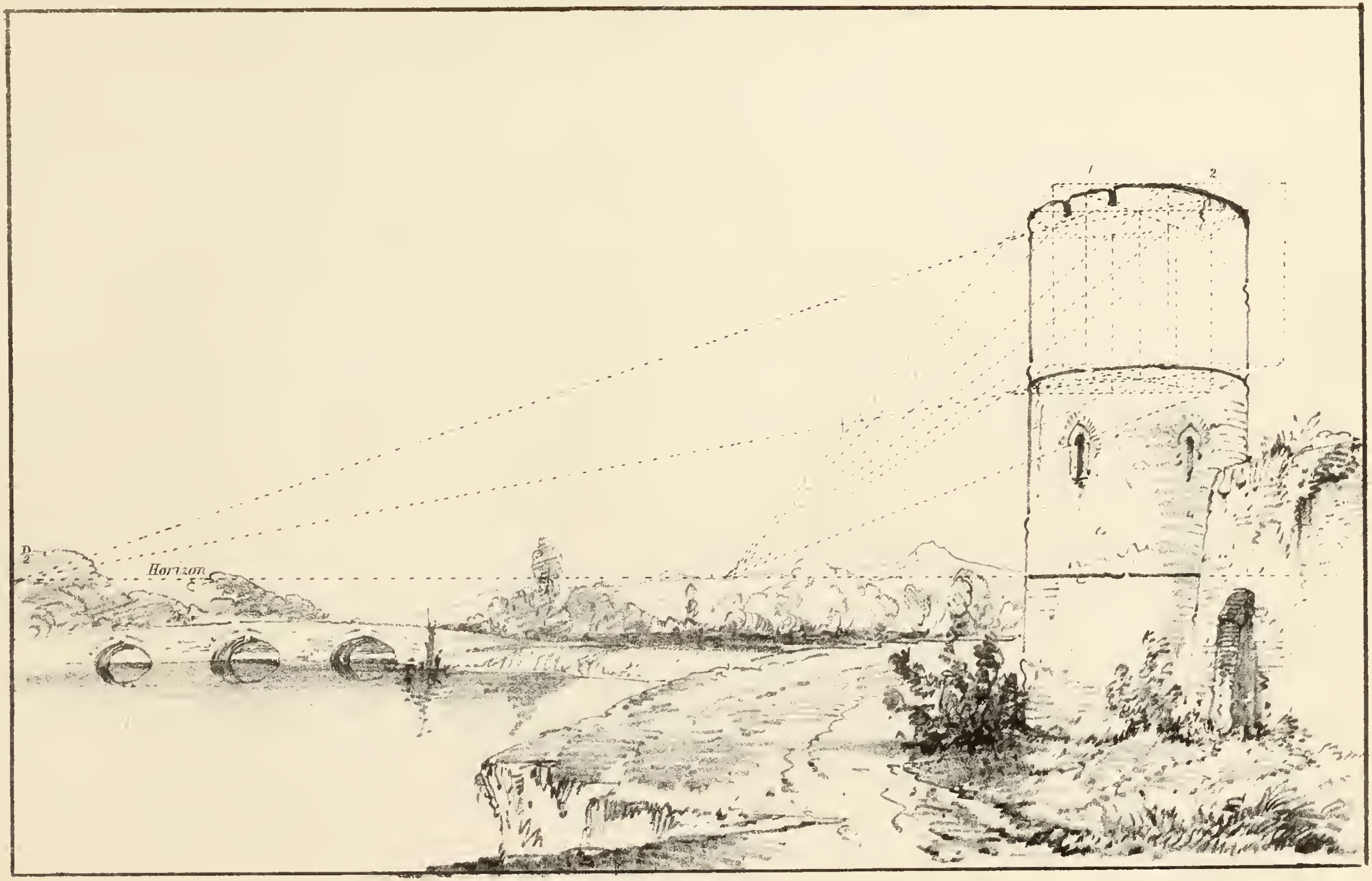
The house No. 1 is seen in front, the vanishing lines of the perspective side incline towards the point of sight. No. 2 is viewed obliquely; the two sides are receding, and they run to accidental points, placed upon the horizon, the same as those of the stone No. 3, the obliquity of which is different, and which has different vanishing points.

The nearer an accidental point approaches the point of sight, the further ought that point to be with which the lines form a right angle. We must conclude that all the vanishing parallel lines reunite in one point upon the horizontal line, unless they represent inclined objects, as in

EXAMPLE XIV

Where the lines of the objects 1 and 2 tend to a point called aerial, above the horizontal line; those of No 3. to a ground point below the horizontal line.

Ex 9.



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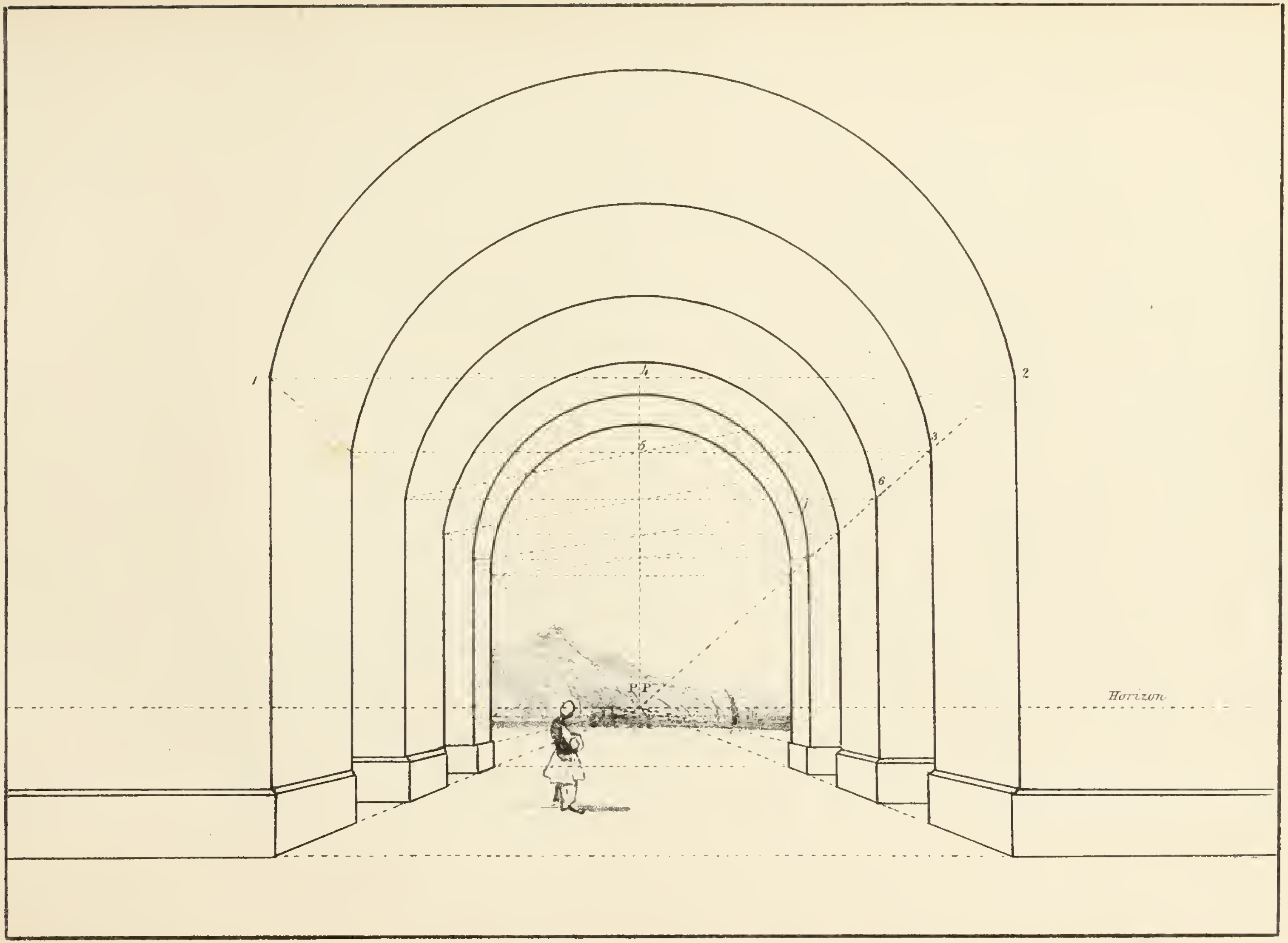

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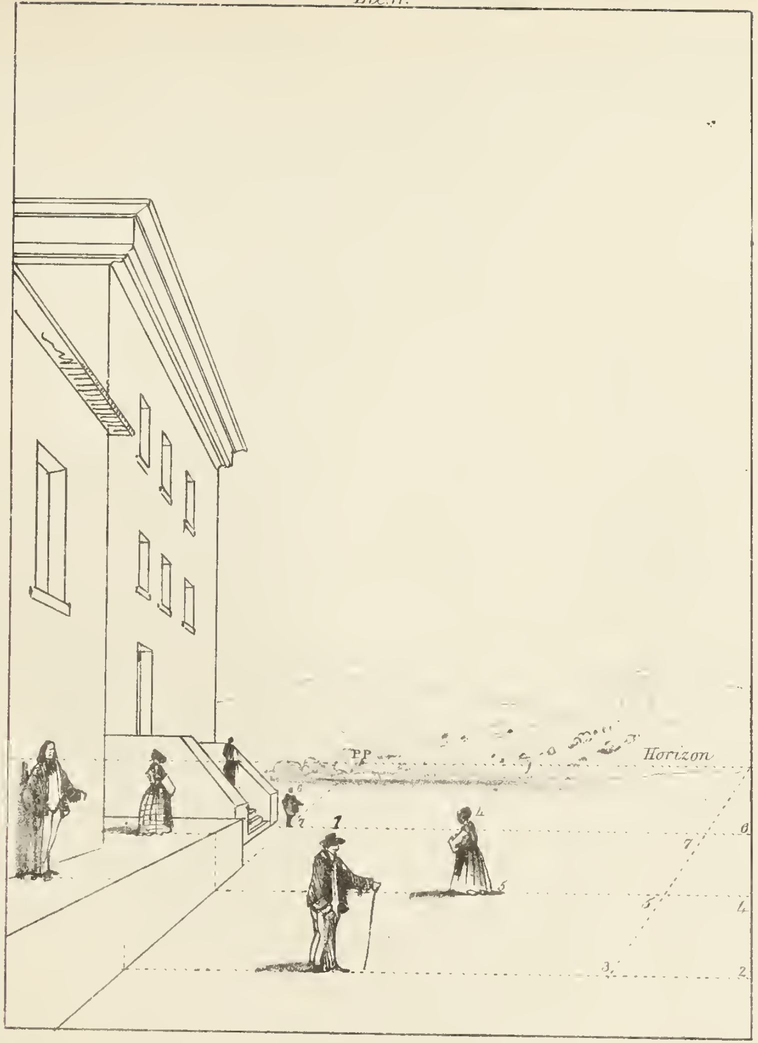

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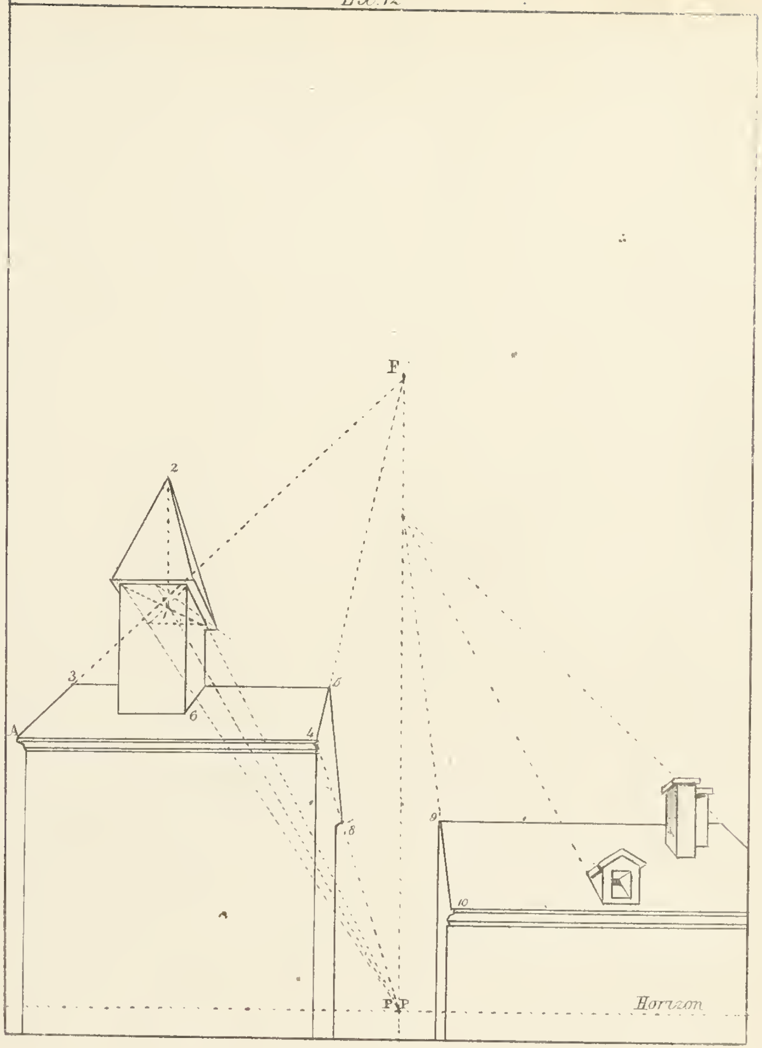

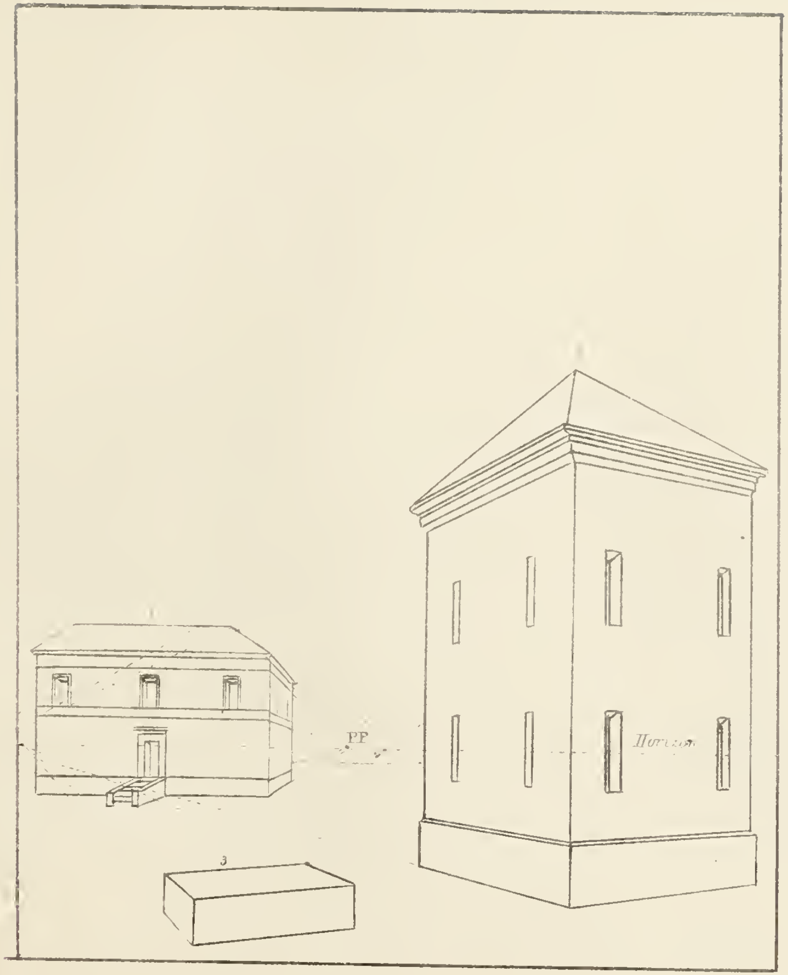

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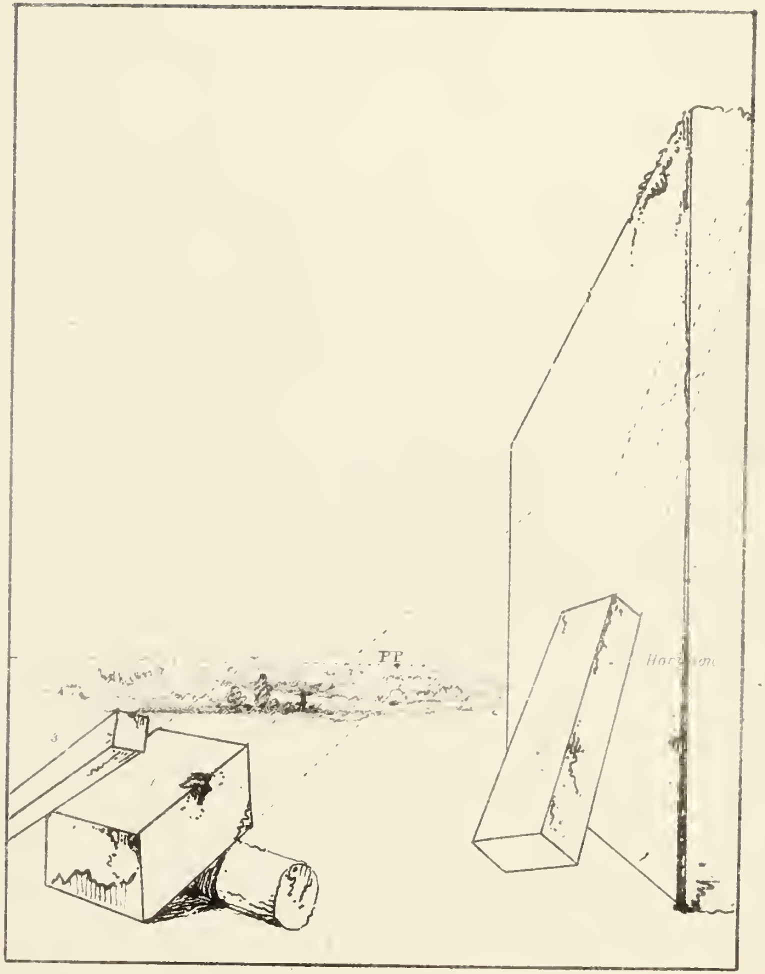

Ex 14.

EXAMPLE XV.

TO DRAW IN PERSPECTIVE A FLIGHT OF SEVERAL STEPS.

Let the landing place be given, A B C D, and the height of the flight, C E, and the projecting of the steps E F G. From the point G, the base of the first step, raise an indefinite vertical line; prolong the line D A until it cuts this vertical; it will there determine at point 4 the perspective height of the flight. Divide this height, G 4, into as many parts as you wish to produce steps (in four for example); from point 1 draw a horizontal line, which will determine the height of the first step at J, with a vertical raised from the point F; through the points of division, 1, 2, 3, 4, carry indefinite lines to the point P P; then join the point 1 and the point A by a line to be prolonged till it meet the point H of the vertical line carried from point P P; from point G also carry a line to point H; these two lines will show the height and depth of the steps at the points 5, 6, 7, 8, 9, and 10, where they cut the lines drawn from the points 1, 2, 3, and 4; from these points draw horizontal lines, which, at their meeting with the two lines drawn from points F and J to the point H, will terminate the flight.

EXAMPLE XVI.

TO DRAW IN PERSPECTIVE A RISING AND DESCENDING GROUND.

Suppose a straight road vanishing in front of the spectator; the ground is horizontal up to the line 1, 2; the perspective lines of different objects placed upon this ground ought to bear towards the point of sight. Starting from this line, 1, 2, the ground descends; all the perspective lines ought to meet together at point 4 beneath the horizon, and placed upon a vertical line lowered from the point of sight. From point 5 the ground again becomes horizontal up to the line 6; the perspective lines placed upon this ground tend towards point P P; the space between the line 6 and the line 7 rises; the vanishing lines of all objects placed there ought to meet at an aerial point taken upon an extended vertical running from the point of sight. For the size of persons,—the horizon giving the height of those placed upon the first horizontal plane, by means of lines drawn to the different vanishing points we shall arrive at their size at the different planes which they occupy.

EXAMPLE XVII.

TO DRAW IN PERSPECTIVE A SUCCESSION OF PILLARS PLACED AT EQUAL DISTANCES AND SURMOUNTED BY CIRCULAR ARCHES.

The surface, A B C D, being given, carry the line C B to V; upon the space A V establish the number and size of the pillars that you wish to comprise in the surface given; through each of these pillars, 1, 2, 3, carry vanishing parallels to the point P P; at the points where they meet the line B V draw horizontal lines which will give the place of the pillars upon the line A B; where they intersect this line raise perpendicular lines, which will give their heights at their junction with the line D C. The corresponding pillars are easily produced by prolonging the horizontal lines until they meet the line E F. To establish the arches—The height and distance of the pillars being obtained, raise upon each the perspective half square, as G H I K; divide the side G H into five equal parts, join the point 4 to the point of sight by the line 4, 7, P P; on each of the three rectangles draw corresponding diagonals to I G and K H; at points 6 and 7, where they cut the line 4, 7, P P, they will give two points of the curve; raise the perpendicular O M, which at point M will give the outer centre of the arch; pass a curve through the points K 7, M 6, and G, and you will have formed the first arch. Work the others the same. To obtain the parallel circle, the front K N being given—Draw the vanishing line N P to the point of sight; lower the point 7 as far as 8; from this point carry a horizontal line to 9; raise an indefinite perpendicular; from point 7 take a horizontal line to where it cuts point 10 of this perpendicular, which point 10 will be one of those of the parallel curve. Repeat this working for as many points as you desire to give.

EXAMPLE XVIII.

TO CONSTRUCT AN ACUTE ARCH. TWO CIRCULAR ARCHES WHICH CUT AT RIGHT ANGLES ARE THUS NAMED.

The arc A C B being given, at the points A B construct the square A B E D; from the four angles of this square raise indefinite vertical lines; carry G F parallel to A B, and tangent to the arc A C B; it will meet the vertical lines raised from the points A and B at the points G and F; from these points carry to the point of sight the lines F P P and G P P, which will meet the verticals raised from the points E and D to points I and L; join these two last points by a line, which will determine the superior square F I L G; describe the half circle E O D, and draw diagonals F L and G I; they will intersect at R, which will be the point where the curves meet. From any point 1, taken at pleasure on the arc A C B, draw a horizontal line, which will cut this arc at point 2, and meet the vertical lines A G and B F at the points 3 and 4; from these points carry to the point of sight some lines, which will cut the verticals E I and D L at the points 5 and 6; join these two latter points by a horizontal line, then draw the diagonals 4, 6, and 3, 5, which will pass through the lines 2 P P and 1 P P at the points 7, 8, 9, and 10. Lastly, draw curves through the points B 7, R 9, D, and through A 8, R 10, and E. A great number of points may be obtained by the same working. To construct the two vanishing arches, draw for example from point 10 a horizontal line, which, at the place where it will meet the line 4, 5, will determine one of the points of these arches. Others may be obtained in the same way.

EXAMPLE XIX.

TO DRAW IN PERSPECTIVE, UPON A GIVEN GEOMETRICAL OUTLINE, FOUR SEMICIRCULAR STEPS.

Through the points, A B C D, *a b c d*, of the geometrical profile carry lines, which, intersecting a vertical line raised from the middle of the base, determine the points E F, which we may consider as the summit of two cones; upon A G and H I, as diameters, describe two perspective half circles, which will give the first step. Take any point 1 upon the base of this stair; raise the vertical 1, 5; carry upon this vertical 2, 3, 4, and 5, corresponding to 1, 2; draw the two lines 1 F and 2 E; join the points 1, 2, 3, 4, and 5, to points R 1, M N O, correspondent centres of the geometrical outlines, through lines which will cut 1 F and 2 I at points 6, 7, 8, 9, 10, and 11; these lines will form one side of the curve of the stairs. Work in the same manner to the points R S, taken at will on the first step, and pass curves through the points obtained.

EXAMPLE XX.

TO FORM UPON A GIVEN GEOMETRICAL PROFILE AN ENTABLATURE AND CAPITAL.

The profile 4, A B C D E F G, being given, from the angles of this profile draw lines to the point of sight and carry out the line A E till it meets the axis H 4 of the column in O; from point 4 to the point of distance take a line which will cut that drawn from point A to the principal point at J: then, as the other point of distance is out of reach, and as there ought to be a line also ruled there to proceed from point 4, we must carry back to the right of the point of sight one-fourth of the distance at D 4; join also the point 4 to the point of sight by the line 4 P P; divide this line into four equal parts; join the point 1 to the point D 4, and draw from point 4 a parallel line to 1 D 4, which will cut at point K the line brought from the point A to the point of sight; this will determine the upper part of the entablature. Join the points J and K to the point O; these lines will cut those drawn from the angles of the profile to the point P P in *b c d*, and *f g*, which will finish the edges of the entablature by lowering the verticals *b h*, and *e i*, which will give the projecture of the brow or coping. The capital will be easily obtained by forming two perspective squares at the edges of the geometrical profile of the plinth, and by describing perspective circles at the points taken at will upon the quarter circle, and by striking curves through the most projecting points. The entablature and the column of the back-ground will be obtained in the same way.

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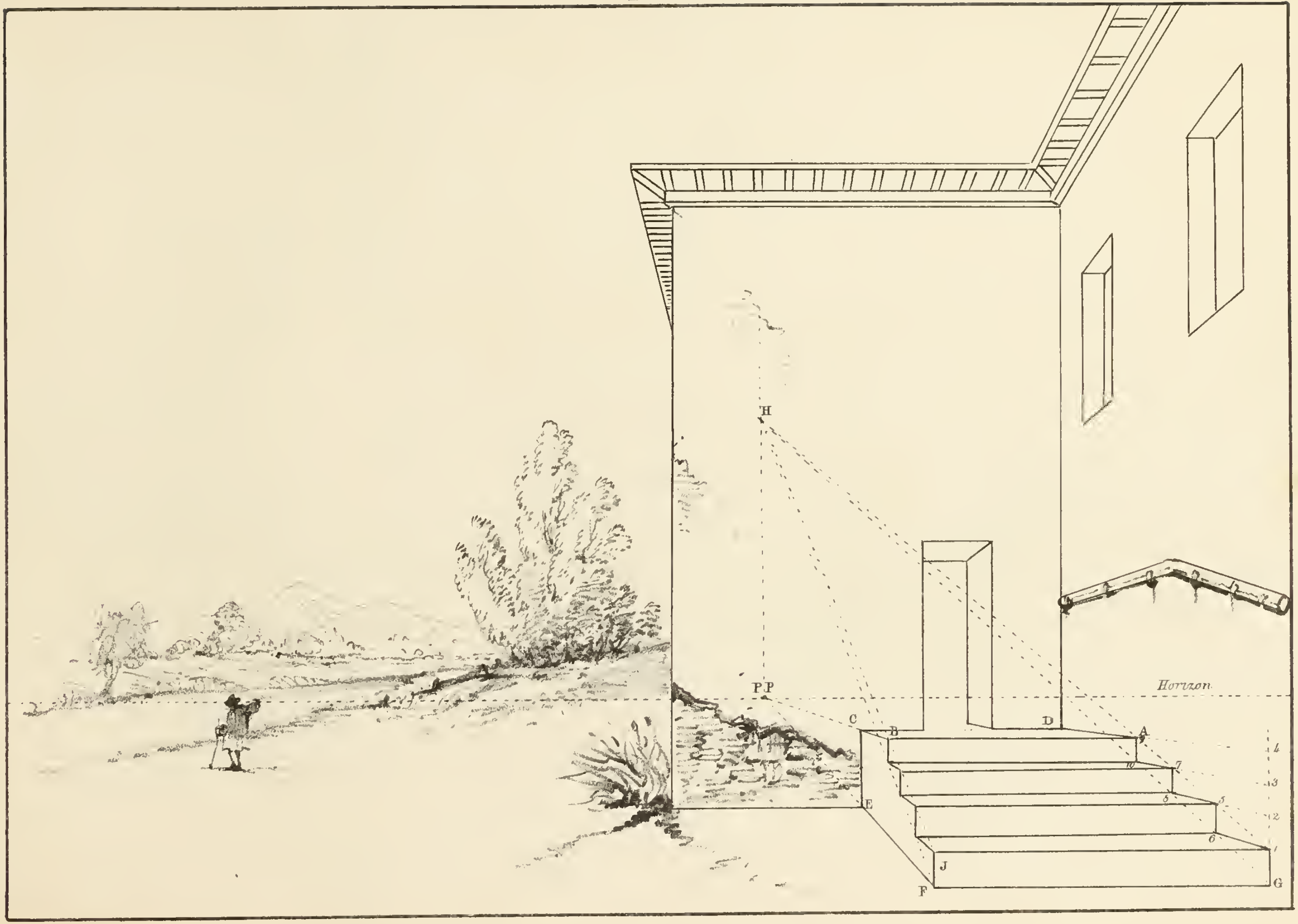

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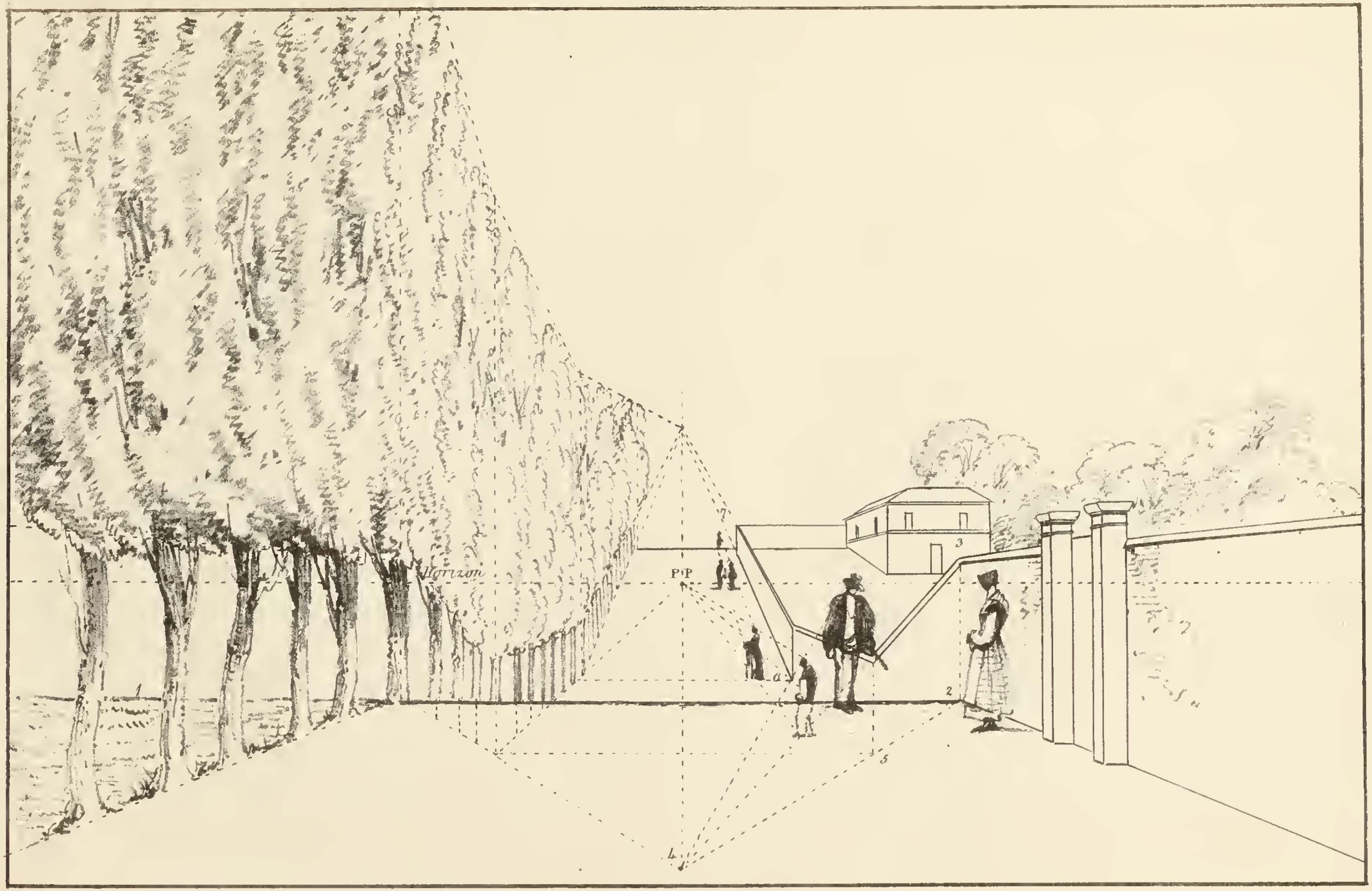

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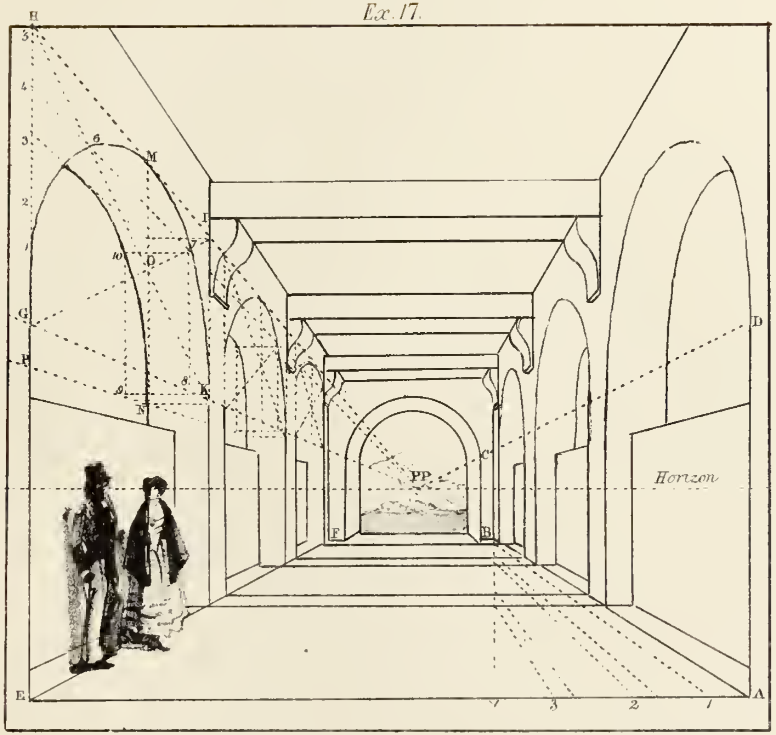
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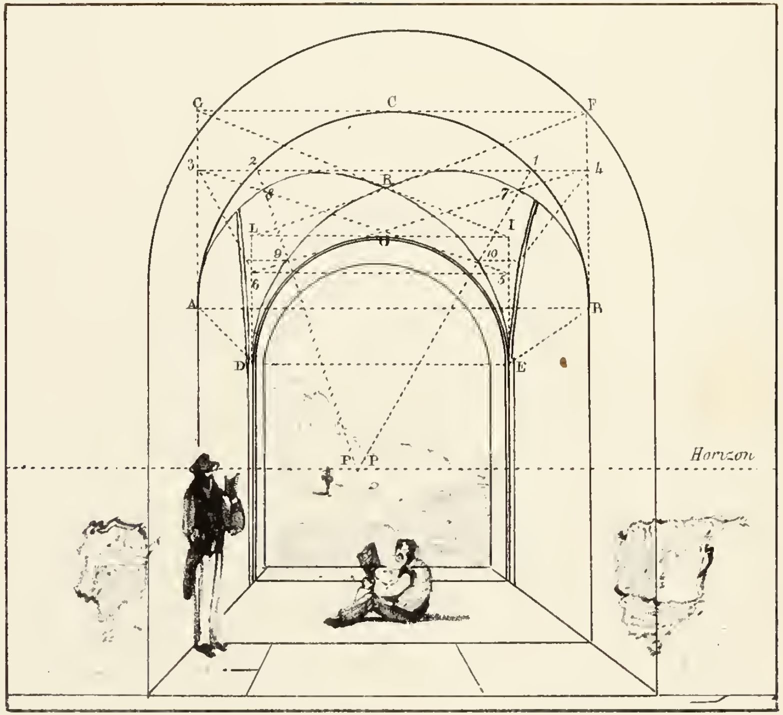
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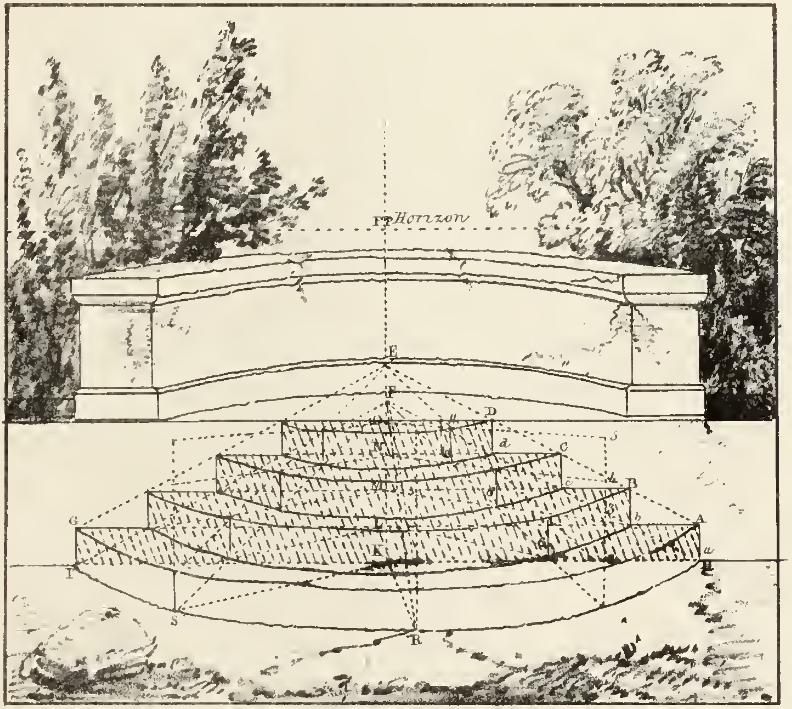
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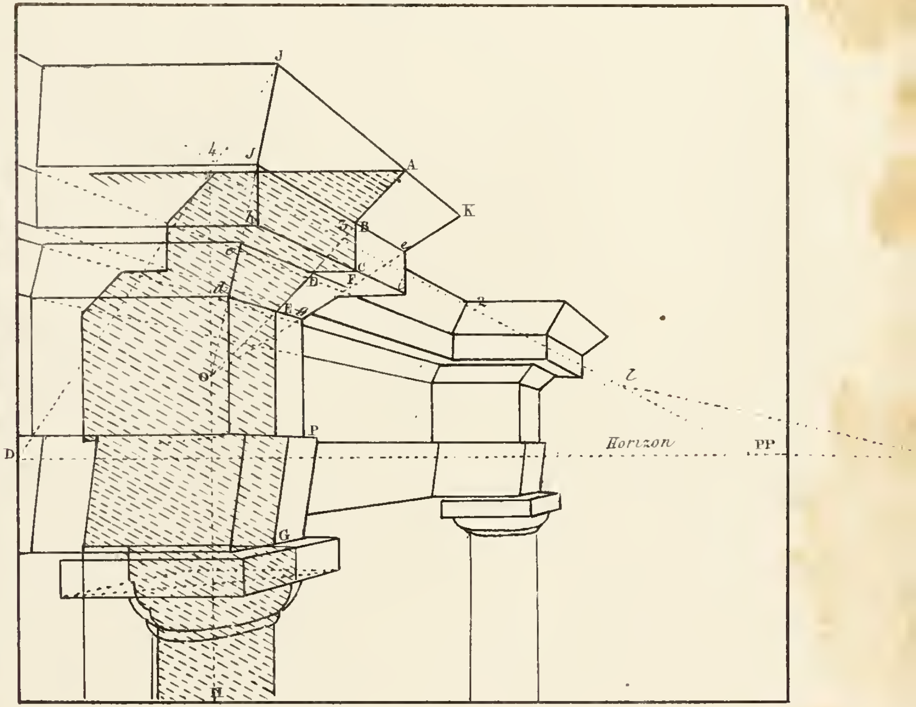
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REFLECTIONS IN THE WATER.

Calm and clear waters reflect faithfully objects which are seen in them, and represent their exact forms.

EXAMPLE XXI.

To obtain the shadow of a vertical line or of any other object—as the reflection is always equal to that which produces it, it is only necessary to repeat underneath the level of the water that which appears above it.

The bridge is viewed in front. The vanishing lines of the partitions of the stone tend towards the point of sight, as well as the reflections of them. The curve of the arch is repeated exactly below, as well as the wall, the door, and every other object.

EXAMPLE XXII.

The preceding observations are alike applicable to objects reflected in mirrors; therefore it is sufficient to repeat perspectively upon the surface of the glass that which we see on this side.

OF SHADOWS.

Objects lighted by the sun are so in many ways, according to their situation and the hour of the day.

EXAMPLE XXIII.

If we choose that time when the shadow is horizontal and parallel to the ground-line of the picture or view, this process will be exceedingly simple, as we have only to draw a horizontal line from the foot of each object illumined, and another line running from the luminous centre (the sun) and passing the top of this object; the junction of this line with the horizontal will give the size of the shadow. The direction of this line is to be resolved at will, observing that the rays of the sun are considered as parallel, on account of the immense distance of this planet.

EXAMPLE XXIV.

The sun is opposite the spectator at point 1, which is the centre of it, and consequently the vanishing point of the rays of light, these rays being considered as parallel. From the sun 1 lower a perpendicular line to the horizon, the point of meeting 2 is the foot of the light and the vanishing point of the shadows of the vertical lines. These shadows, being formed by parallel vanishing lines, unite at one point—thus, 1, 2, are vanishing points; 1 for the rays of light, and 2 for the parallel vanishing lines upon the perspective ground, the same as upon the horizontal planes. The point 3 is the vanishing point of the length of the shadow through the horizontal line upon the vertical surfaces, as the wall 4 upon the wall 5.

EXAMPLE XXV.

If the sun be behind the spectator, we arrange at will the length and breadth of the shadow of any object, such as that of the figure A, and draw towards the vanishing points shadows which are inaccessible. For this purpose prolong the direction of the shadow to the horizon in B. This point will be the vanishing point of the extent of the shadows through the vertical lines upon the horizontal ground. Then join the top of the head to the extremity of the shadow of the front; carry a line to where it meets a vertical lowered from point B, which will give the point N; this will be the vanishing point of the solar rays. Thus will be determined the track of light and the luminous point—one by point B, and the other by point N.

EXAMPLE XXVI.

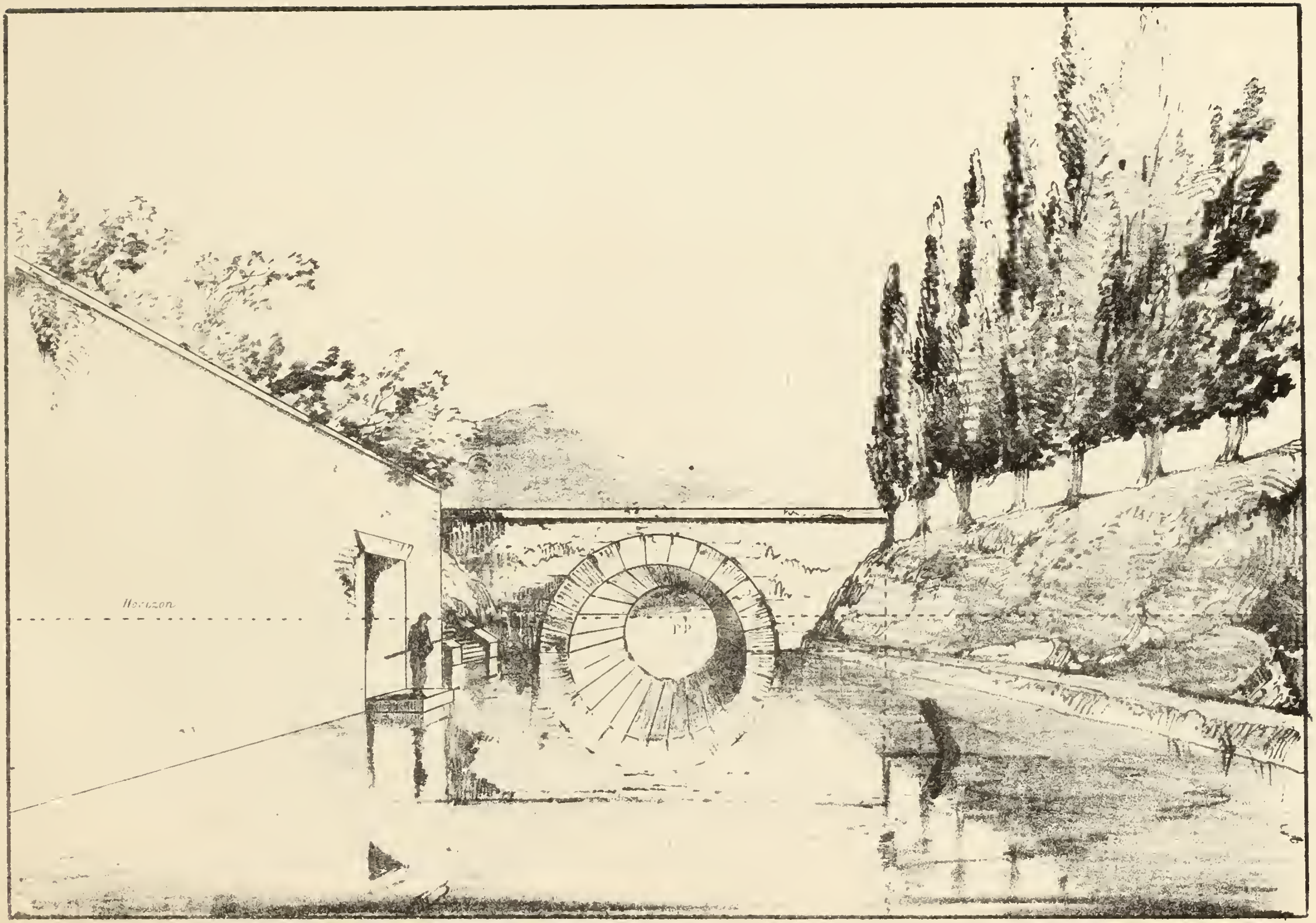
To ascertain the vanishing point of shadows thrown by horizontal objects upon vertical surfaces, it is necessary only to draw from point N a horizontal line to meet a vertical lowered from the point of sight. These principles apply equally to objects illuminated by artificial light. Thus,

Suppose a candle or torch placed upon a table, the shadows projected are determined by lines running from the focus of the light 1, and from the foot of the light 2, passing by the upper and lower extremities of the objects.

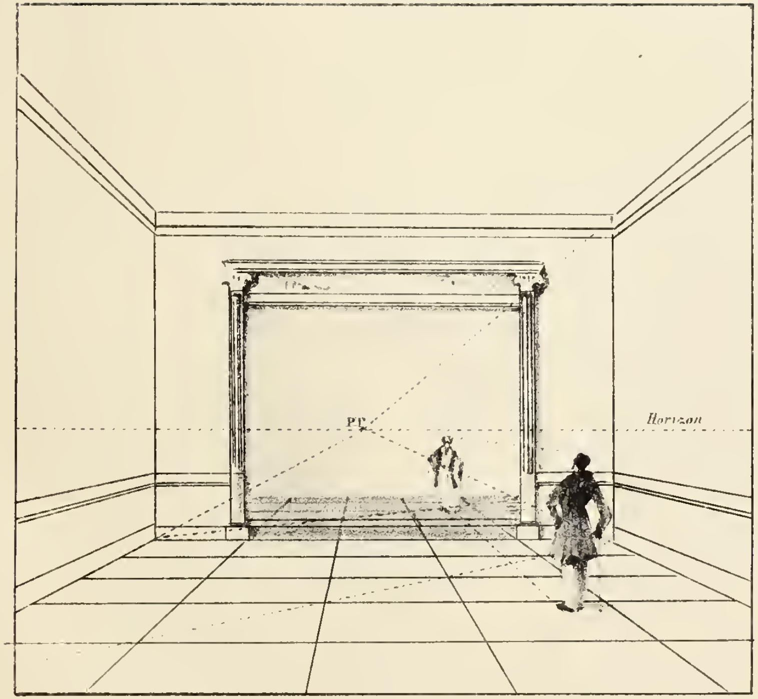
* * *

Such are the elementary principles of perspective that we have deemed essential to pupils for the study of landscape drawing, especially after nature.

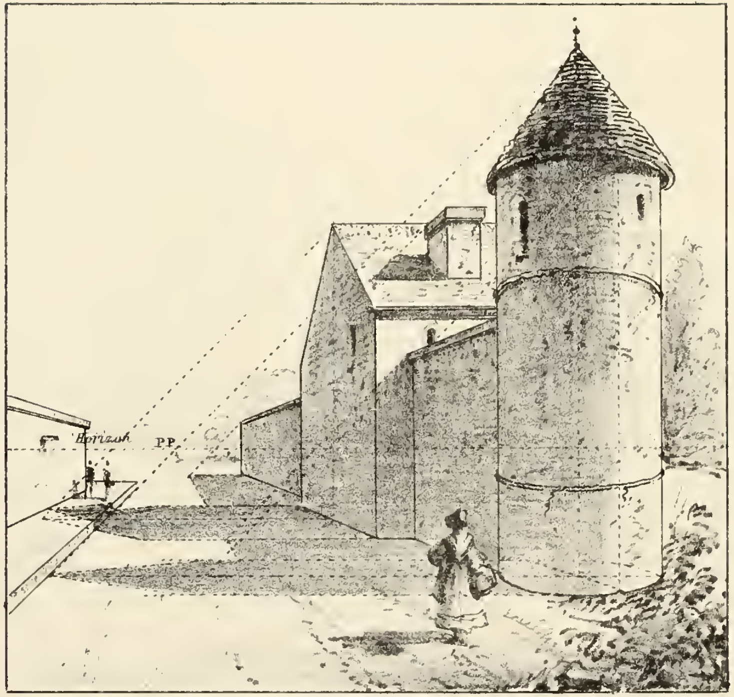
Ex. 21.



Ex. 22.



Ex. 23



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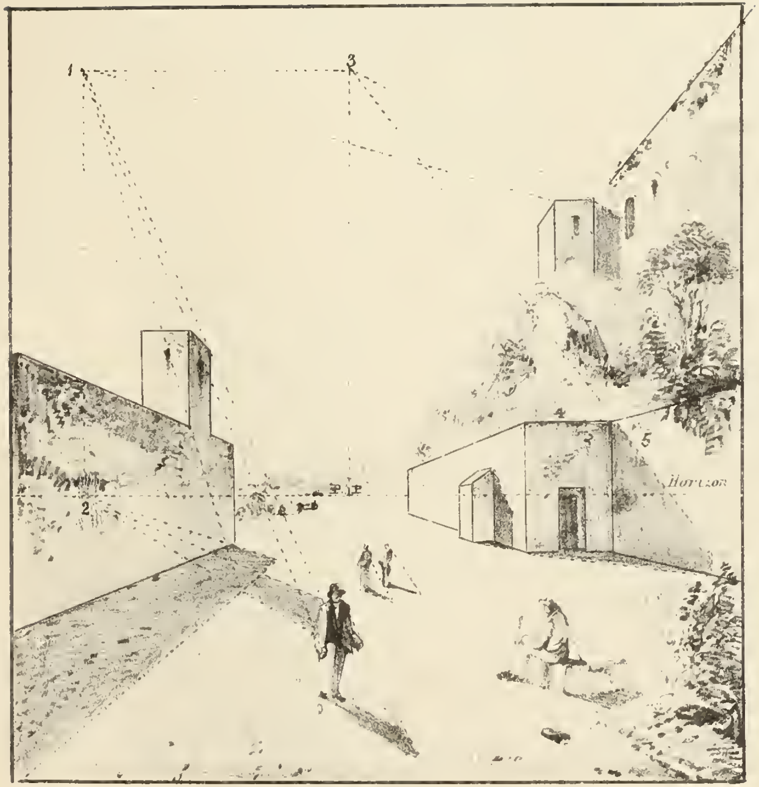

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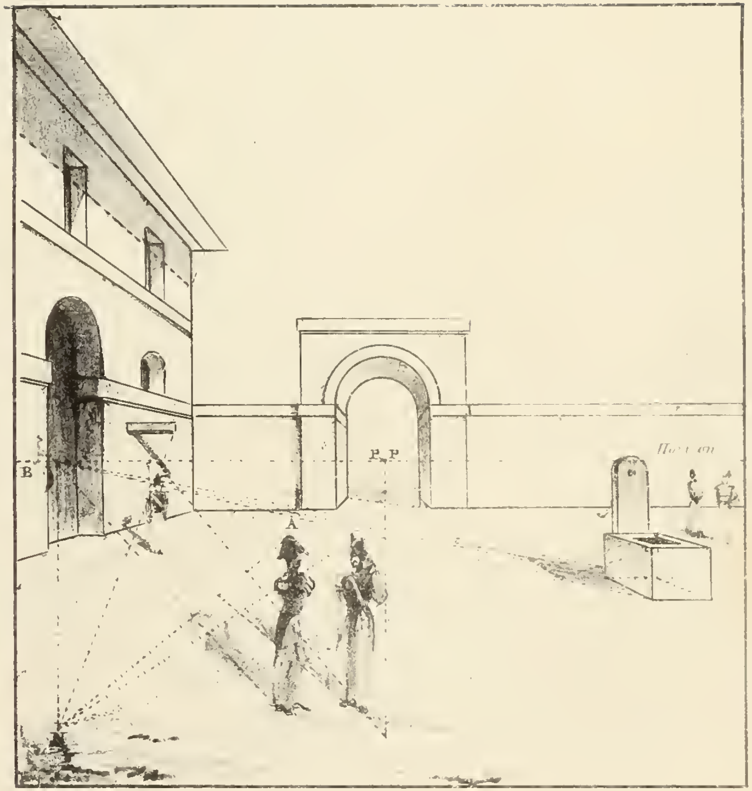
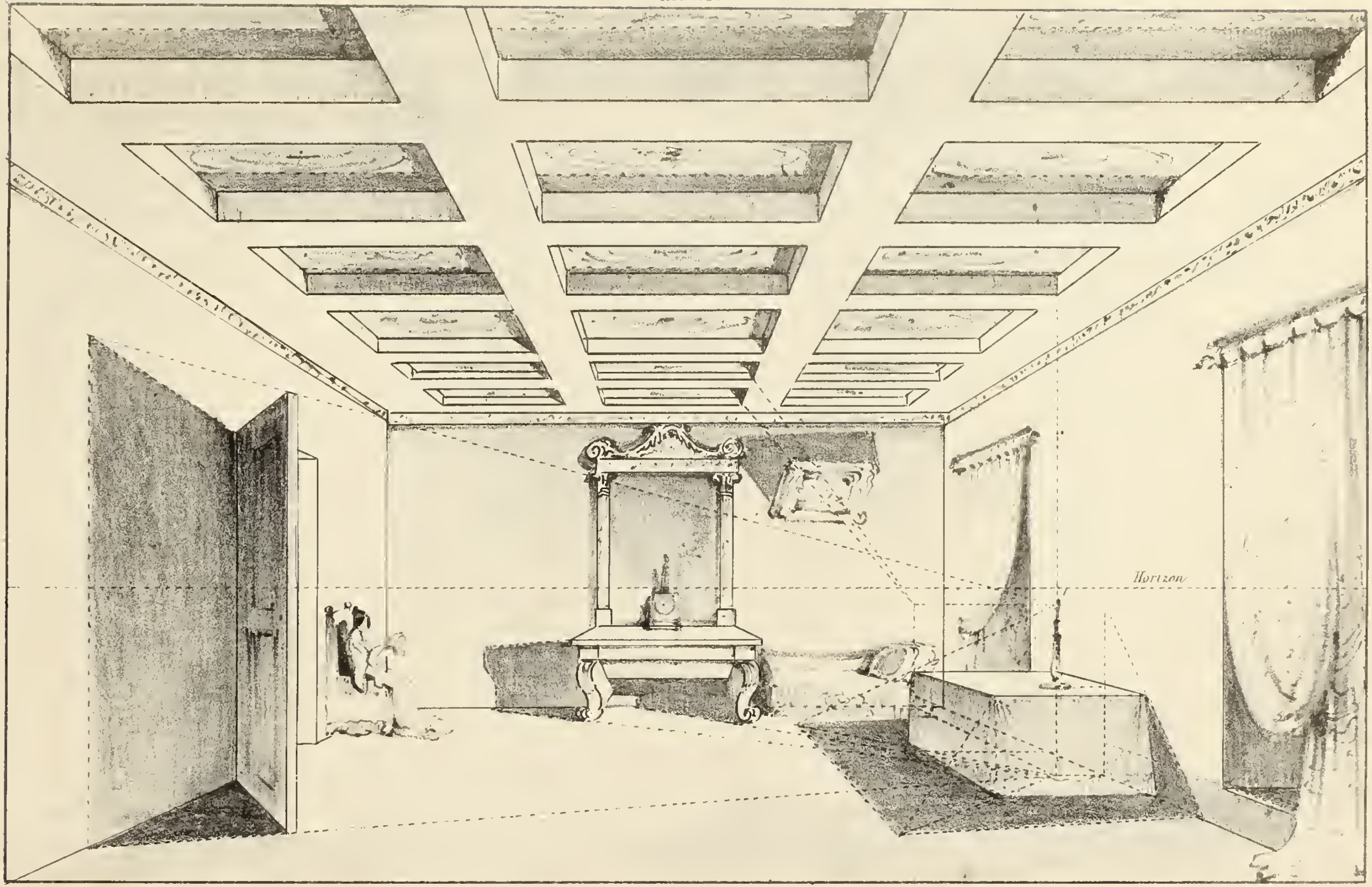


Fig. 20.



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